Building Virtual Museum Exhibitions
An Overview of ARCO

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ARCO Project Partners

The University of Sussex (UK)

The Sussex Archaeological Society (UK)

The Poznan University of Economics (Poland)

Commissariat a l'Energie Atomique (France)

Giunti Gruppo Editoriale (Italy)

University of Bath (UK)

Victoria and Albert Museum (UK)

ARCO Background

- ARCO started in October 2001 as a three year RTD project
  - scheduled to finish September 2004
- Seven partners including two museum pilot sites from 4 European countries
  - United Kingdom, France, Poland, Italy
- Co-funded by the EC under the 5FP (IST)
  - Total investment is 2.8M Euro. 2.0M Euro from the EC

ARCO Technology Overview

ARCO Project goals

Prototype systems and components

Digitisation of artefacts

3D modelling and refinement

Storing and managing digitised objects

Visualisation of digitised artefacts

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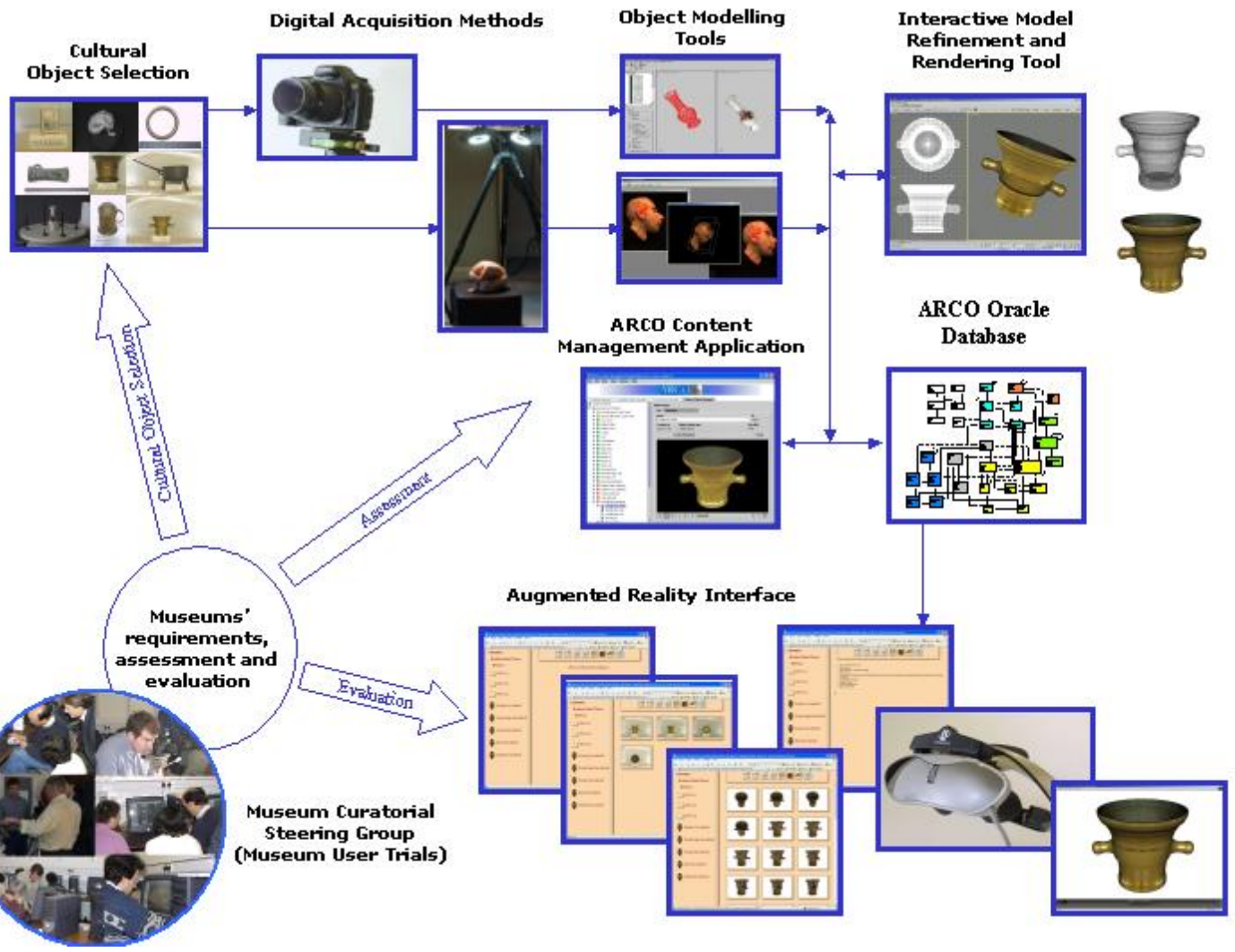
Goals of the ARCO Project

- Develop innovative technology and expertise to help museums **Create**, **Manipulate**, **Manage** and **Present** cultural objects in virtual exhibitions both within museums and over the Web
- Why?
  - To allow museums to have an online (3D) presence
  - To enable interaction with digital representations of collections
- How? By building a set of tools and processes from digitisation to visualisation:
  - **Digital capture of artefacts**, **3D modelling and refinement**, **Database and content management**, **Visualisation in virtual or augmented reality environments**
  - **Interoperability** i.e. an Open Architecture
    - XML Data Exchange between tools and other systems
    - Internet, Web, graphics and metadata standards

ARCO Prototype Systems and Components

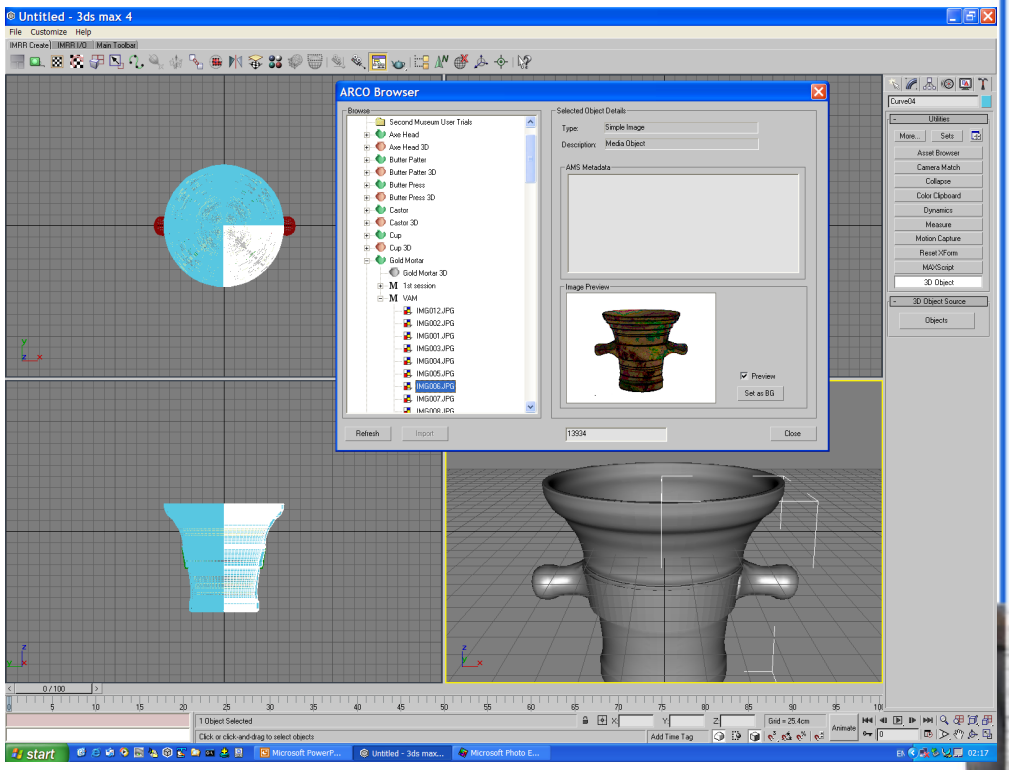


Create: Digitise Artefacts with the Object Modeller

- Method of modelling depends on features of the objects
  - Objects with simple geometry are modelled with modified 3ds max or Maya
- For complex models we use a custom built stereo digital camera system:
  - Object geometry and textures are extracted from sequences of stereo pictures and merged to produce a 3D textured model
  - Portable in order to gain access to fragile artefacts
  - Ease of use for museum staff who are not experts in 3D measurement
  - Result should be an accurate 3D model of the artefact in terms of shape, texture and resolution
  - Automated stereo reconstruction as far as possible

Manipulate: 3D Modelling and Refinement

- A tool for interactive model refinement and rendering
- Creation of simple models and refinement of digitised models
  - smoothing the object geometry
  - reducing polygon count for Internet based rendering
  - re-applying lighting
  - repairing missing parts
- Database connectivity
  - search and browse objects
  - import and export models (including models generated by other methods, e.g. Mechanical scanning, Laser scanning)



Media Objects from Creation & Manipulation Stages

Sample media objects representing cultural objects in the database:

- Images from the photogrammetry process
- VRML models exported from model refinement

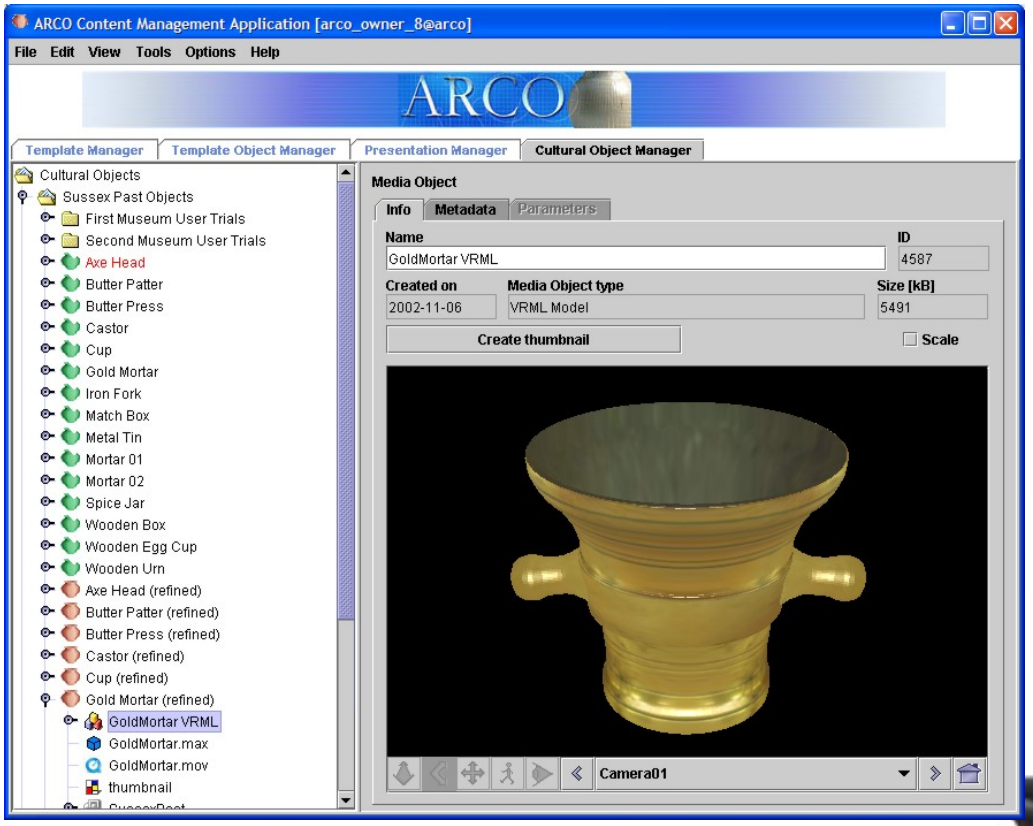






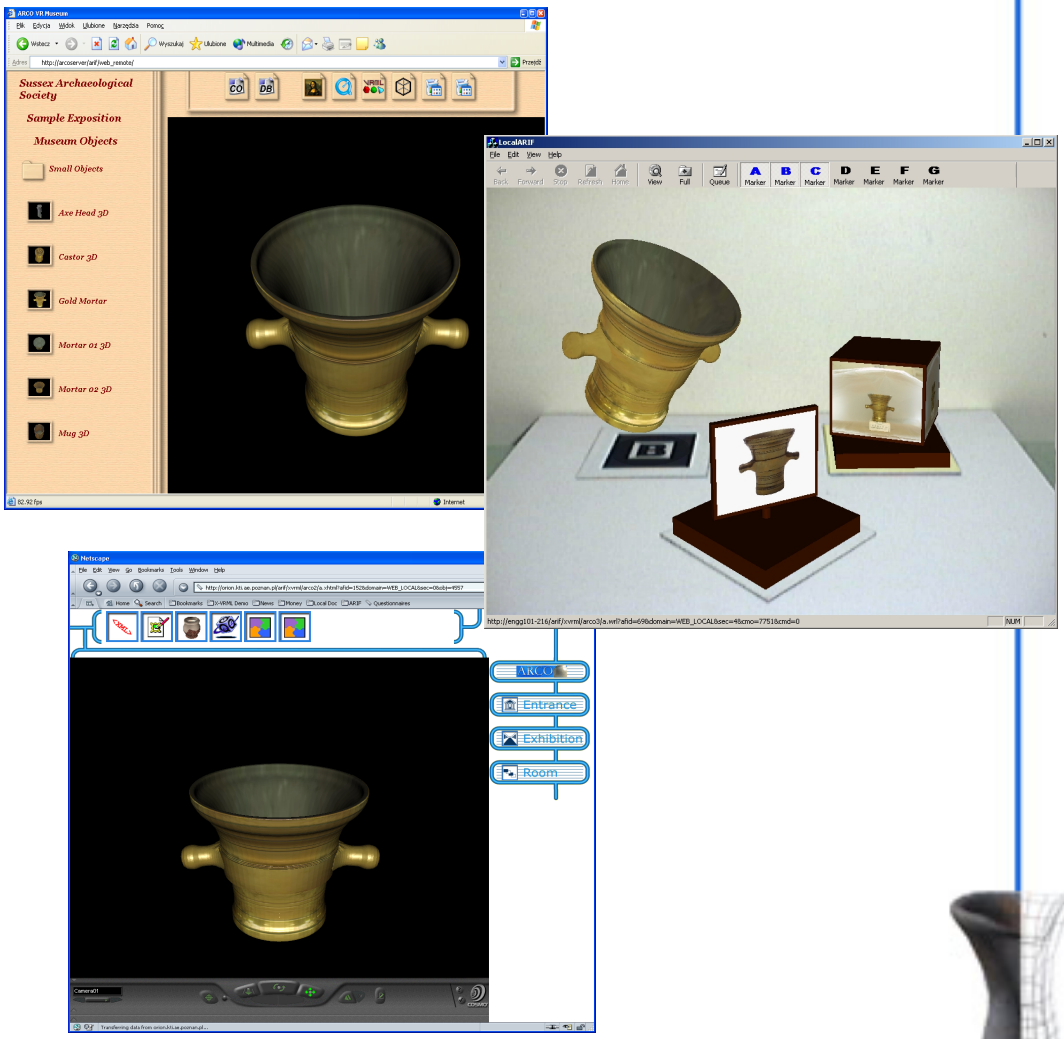
Manage: Content Management Application

- All ARCO data is stored in a database for consistency
- Museums do not manage the database directly, but through a Content Management Application (ACMA)
- ACMA provides several managers for ease of data manipulation, e.g.
  - Cultural objects
  - X-VRML templates
  - Virtual exhibitions



Presentation: Augmented Reality Interfaces

- Visualisation of ARCO media objects from the database
  - VRML models, metadata, images, virtual exhibitions
- Three visualisation interfaces, same database contents
  - Remote Web Interface (search, browse)
  - Local Museum touch-screen (search, browse)
  - Local Augmented Reality environment (interact)



Conclusions

- ARCO is developing an open architecture that integrates state-of-the-art with ARCO specific technologies to enable museums to build virtual exhibitions
  - Digitisation and modelling of 3D museum artefacts (OM)
  - Refinement and creation of the 3D virtual museum artefacts (MR)
  - Object relational database and content management (ACMA)
  - Visualisation of museum exhibits in virtual environments (ARIF)
  - Integrated through XML technologies (X-VRML, AMS, XDE)
- ARCO tools are end user driven through museum pilot sites being closely integrated into the design process
- Visit us at the ARCO website:
  - http://www.arco-web.org/

Benefits for Small Museums

Sussex Archaeological Society
Six regional museums in Sussex, UK
with some 500,000 objects

John Manley (Sussex Past)

Small Museum Attributes

- Some attributes of small museums…
  - They are in the majority
  - Often no dedicated ICT staff
  - Very often no professional photographic skills
  - They are not well-funded
  - But they are cherished, rooted in their localities, and aspire to do their best
  - They strive to achieve national standards

Incarcerating Objects

- The small museum as a prison …
  - Objects in them once had real lives and, *for example*, were meant to be handled, or worn, or drunk from, or contained something, or displayed on walls etc, often in the immediate locality
  - We remove them from those local contexts and then lock them in glass display cases
  - We can no longer explore their physicality in the round
  - And then the museum curator tells us what's important about the object

Liberating Objects

- ARCO system as liberator …
  - ARCO can display, remotely or in-gallery, objects in the round
  - Can link objects with other objects and local places where they were found
  - Offers different visual perspectives of an object which can provoke novel opinions from the viewer, avoiding reliance on the curator
  - Enhances the sensual experience of the physicality of real objects

ARCO Benefits for Small Museums

- ARCO and small museums…
  - ARCO provides interactivity, and intelligent, non-passive artefacts
  - Liberates them from the glass case and curators' labels
  - Decreases the psychological distance between object and viewer
  - Moves a step closer to allowing objects to be experienced as real things, once used by local people in their own localities
  - Thank you